



Photonic Devices For Converting Light Energy Into Mechanical Energy, Forces, and Displacements

Tech ID: 34083 / UC Case 2024-890-0

BACKGROUND

Electromechanical technologies serve the majority of actuation needs in industry, with examples that include piezoelectric and electromagnetic actuators. While effective in many applications, these technologies have limitations, due to their bulk, dimensional constraints limiting integration density, their need for complex driving electronics, and their production of electromagnetic interference (EMI). There is a need for miniature actuator technologies that avoid such compromises, that simplify power distribution and control, minimize EMI, reduce electronic complexity, and can be deployed in configurations or arrays of actuators that can be scaled according to application requirements. This technology is suitable for diverse applications requiring compact, scalable, EMI-free, facile mechanical actuation.

DESCRIPTION

Researchers at the University of California, Santa Barbara have devised a miniature photonic actuator technology that produces mechanical forces and displacements generated by light. These actuators have scalable dimensions of millimeters or more, yielding scalable displacements and forces, on the order of 2 Newtons per cubic centimeter, with response times as rapid as 2 milliseconds. Forces are produced using pulsed light rather than electrical driving, through the conversion of optical to mechanical energy. Thus, these devices generate negligible EMI. Light may be supplied via an integrated LED, a low-power laser, or via fiber optics. Their layered design, mechanism of actuation, optical driving technique, and use of widely available materials render this technology practical, scalable, and deployable in single actuator form, or in arrays of hundreds of actuators. Their rapid actuation speed, scalable output, and reduced electronic complexity make them adaptable across various industries.

Publication: <https://arxiv.org/abs/2410.05494>

ADVANTAGES

- ▶ Efficient photonic drive, using pulsed light for addressing and powering
- ▶ Minimal electromagnetic interference
- ▶ Flexible integration in configurations of different sizes and scale
- ▶ Scalable to meet application requirements
- ▶ Compatible with mass manufacturing processes

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OTHER INFORMATION

KEYWORDS

photonics, photonic actuator,

biotechnology, haptics, virtual

reality, augmented reality

CATEGORIZED AS

- ▶ [Optics and Photonics](#)
- ▶ [All Optics and Photonics](#)

RELATED CASES

2024-890-0

APPLICATIONS

- ▶ Material processing systems
- ▶ Biotechnology and microfluidics
- ▶ Haptic devices and displays
- ▶ Automotive controls
- ▶ Virtual and Augmented Reality

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Highly Stretchable & Flexible Electronic Sensors](#)
- ▶ [Integrated Soft Optoelectronics for Wearable Health Monitoring](#)

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